MINI-CAN User Manual

Issue – 1.01

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Kit Contents

You should receive the following items in your MINI-CAN development kit:

1 - MINI-CAN Board
2 - CD containing manual and reference material.
3 - EDK Discount Voucher (redeemable at Insight Memec UK)
4 - Evaluation ISE tools and/or ISE Webpack CD pack.

Figure 1 – MINI-CAN Board

Introduction

Welcome to your MINI-CAN the low cost Spartan-3 and CAN Bus Development Board. MINI-CAN is a member of Enterpoint's Moel-Bryn product range and offers a flexible approach to prototyping FPGA and System designs.

The aim of this manual is assist in using the main features of MINI-CAN. Please read the entire User Manual before attempting to use the board.

MINI-CAN comes with a XC3S400-4FG456C Spartan-3 fitted. Optionally a fine pitch connector and/or LVDS input termination resistors can be fitted at extra cost.

We can also offer custom modules for this product if you need a special add-on. Typical turn around for this service is 2-4 weeks if parts can be obtained in time.

Finding Your Way Around

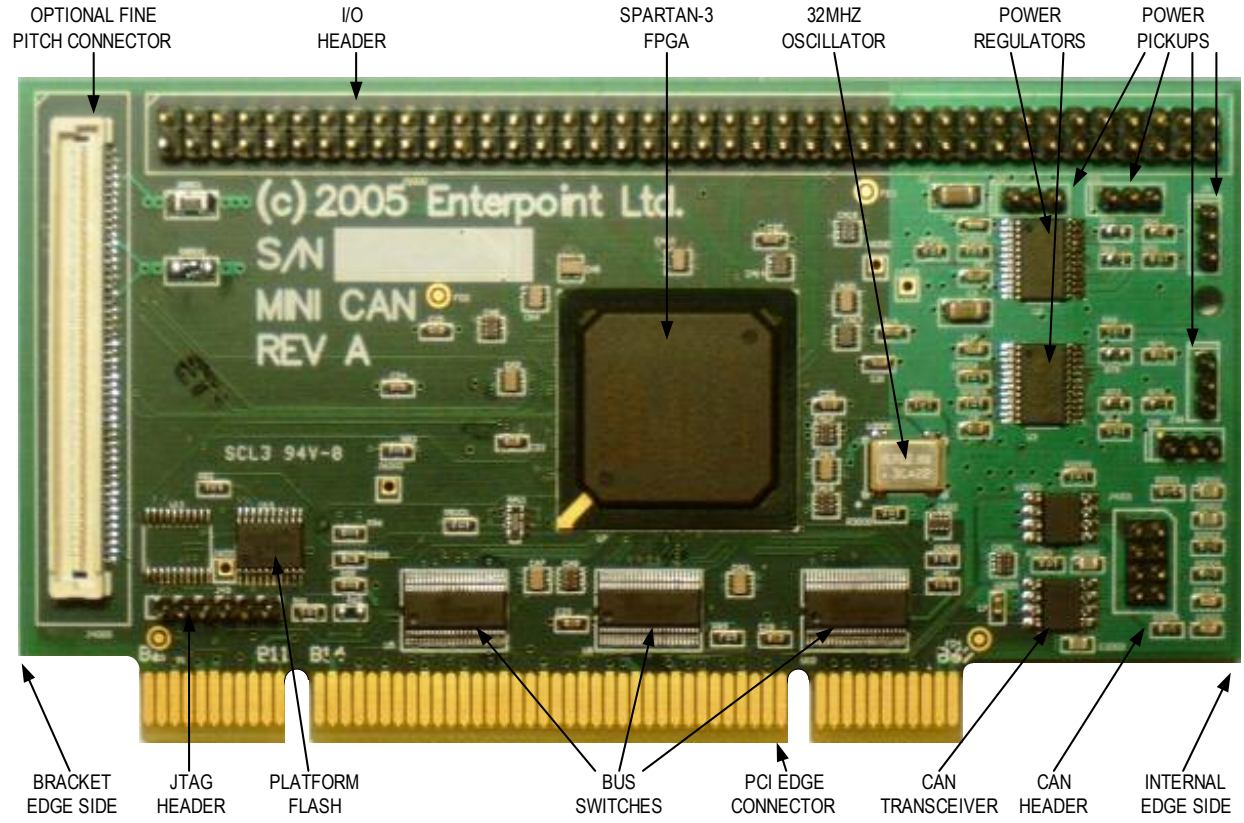

Figure 2 - Front Side of MINI-CAN

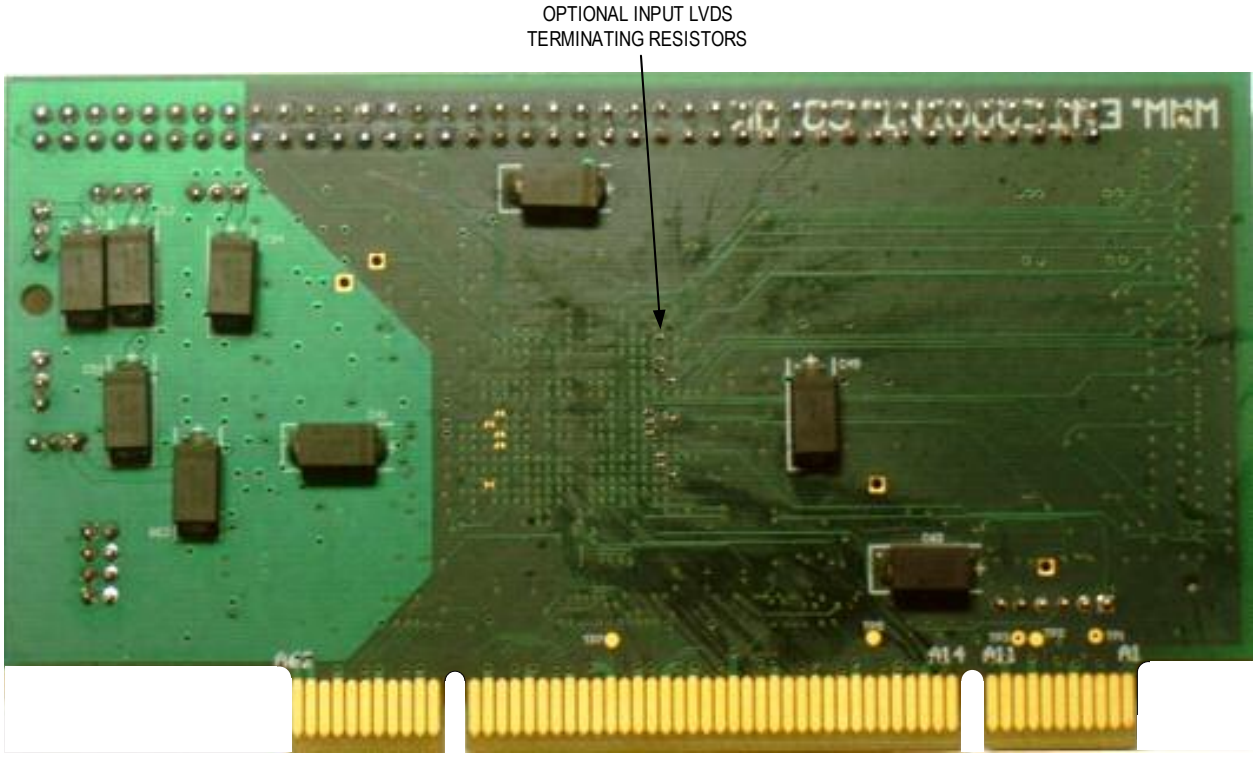

Figure 3 - Back Side of MINI-CAN

Getting Started

Your MINI-CAN has no jumpers to set. All that you need to do is decide how you are going to power the board.

The simplest way to power your MINI-CAN is in a computer PCI slot or using an optional PCI I/O Expansion Modules. Please ensure that adequate backups are made of the computer that the MINI-CAN is going to be plugged into before inserting the card. The computer should also be switched off when the card insertion is made or when the card is removed.

PLEASE NOTE THAT IT IS POSSIBLE TO INSERT YOUR MINI-CAN INCORRECTLY INTO A PCI SLOT EITHER DISPLACED OR BACK TO FRONT.

MINI-CAN is double keyed to allow use in both 5V and 3.3V PCI slots. To correctly insert the Bracket Edge Side should be nearest to the computer case where PCI expansion cards normally are screwed down.

Figure 4 - MINI-CAN Correctly Located in a PC Motherboard

Figure 5 - MINI-CAN Correctly Located in a PCI I/O Expansion Module

Please note that your MINI-CAN is delivered un-programmed and computer that is used as a host will not recognise the card correctly whilst in this state. For correct recognition you will need a PCI supporting design to be loaded into the MINI-CAN and to have a suitable driver available for your operating system.

MINI-CAN only needs a single 5V power supply to operate. All other power rails are generated on-board. As an alternative to using the PCI Edge Connector for power input you can connect 5V power to the MINI-CAN by using the 5V Power Pickup, the power pins on the I/O Header, or (if fitted) the Fine Pitch Connector. If using any of these methods take extreme care to make the connections correctly. It is also advisable to use a current limited supply with an initial limit maximum of 1 amp, or less, set. Most FPGA designs will be below this limit and un-programmed the board will actually take about TBA mA. If you can measure input current alter that current limit once you have established the peak current a given FPGA design takes.

WARNING - IF YOU USE THESE METHODS AND INCORRECTLY CONNECT THE POWER INPUT YOUR WARRANTY MAY BECOME INVALID.

To program your MINI-CAN you will need a programming cable such our PROG1 cable or Xilinx programming cable with flying leads and software like Xilinx Impact (part of ISE).

Figure 6 - PROG1 Programming Cable

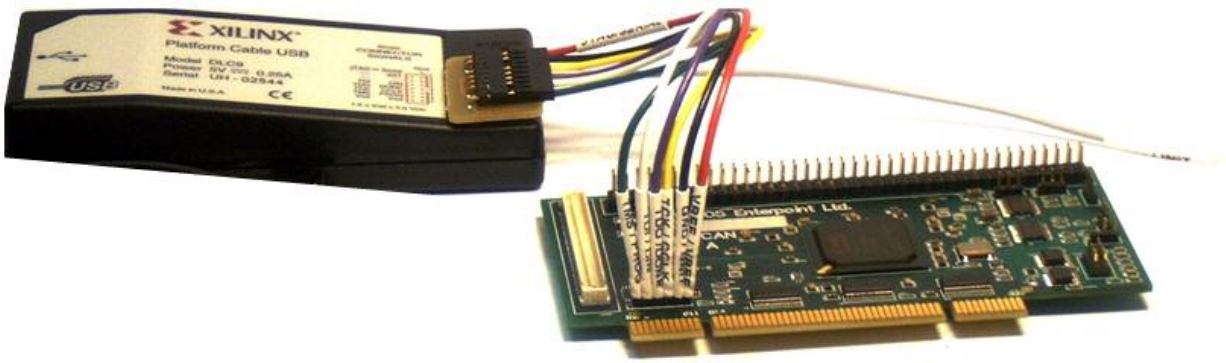

Figure 7 - Xilinx Platform Cable USB Connected to MINI-CAN

The programming connector consists of 6 pins of 2 mm header. Connections to this header are as follows :

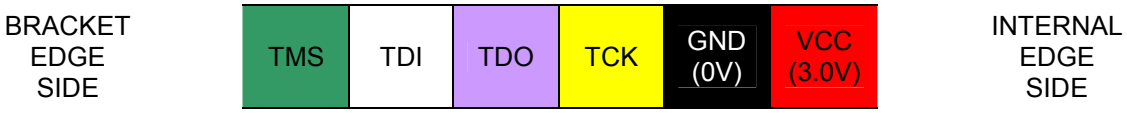

Figure 8 - Programming Connections

The ISE tools supplied with MINI-CAN will give 60 days evaluation of the toolset. Beyond that you can, for free, download ISE Webpack from Xilinx at http://www.xilinx.com/webpack . ISE Webpack will give you VHDL/Verilog synthesis, the backend place and route, and programming tools for your MINI-CAN.

MINI-CAN Features

Power and Power Pickups

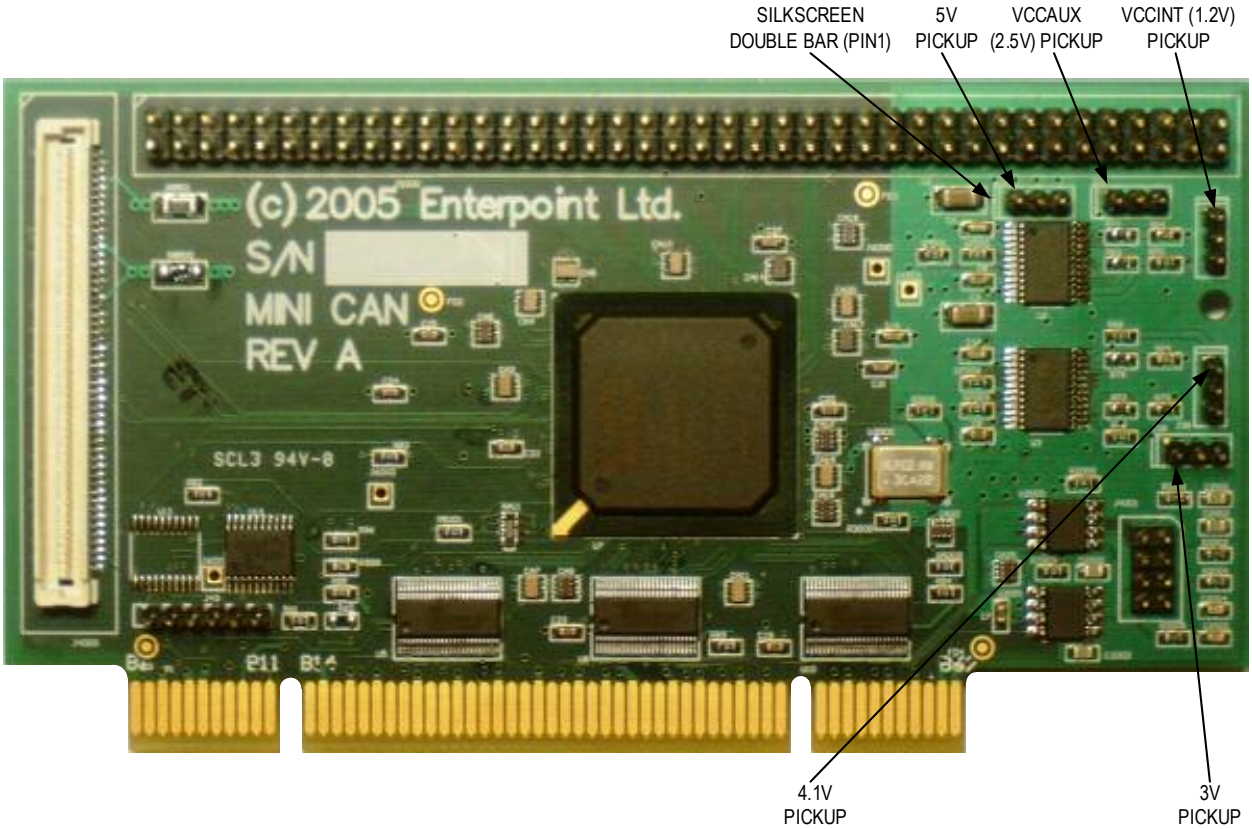

Figure 9 - MINI-CAN Power Pickup Points

MINI-CAN has several power pickup points. Each pickup consists of a 3 pin 2mm header. The pinout of the 3 pin pickup points is usually defined as:

Pin1 - Voltage O/P (double bar on silkscreen)
Pin2 - Isolated
Pin3 - Gnd (0V)

These headers allow the powering of external components or monitoring of power rails. The 5V power pickup can also be used to feed power in and power the board when not fitted into a PCI slot.

The user should take care not to exceed the limits of linear regulators fitted to MINI-CAN. The individual rail limits are as follows:

Voltage	Header	Current Limit
5V	J33	2 Amps (Dependent on I/P)
4.1V (Bus Switch Vcc)	J39	1 Amp
3.0V	J38	2 Amps
2.5V (Vccaux)	J10	1 Amp
1.2V (Vccint)	J9	2 Amps

The 1.2V, 2.5V, 3.0V, and 4.1V power rails are generated by Texas twin regulator packages TPS70402 and have thermal overload protection. Under warm conditions the above current limits may not be reached before a shutdown occurs. You can assist the cooling by using a computer fan or desk based fan to blow air over the MINI-CAN if these thermal limits cause an issue.

Power, and GND, are available for 3.0V and 5.0V at the I/O Header. You can use the 5V connection to feed 5V into the MINI-CAN here too.

Figure 10 - Power on the I/O Header

If you have the optional Fine Pitch Connector you can pick up 3V and 5V from this connector. 5V can also be feed into the MINI-CAN. Please see the pinout of the connector for supply details.

FPGA Bank Voltages

MINI-CAN has a single voltage for Vccio. This set to 3.0V at production. It is generated by a TPS70402 but can be varied by different resistor fitment between 1.22V and 3.6V(Spartan-3 limit).

FPGA Vref Voltages

MINI-CAN does not support Vref voltages.

Programming MINI-CAN

Please see the "Getting Started" section for details of the JTAG programming connector. The JTAG chain contains two devices. These are a XCF02SV02C and the Spartan-3 device (XC3S400-4FG456C).

Programming of the Spartan-3 FPGA can be achieved by direct JTAG programming or from the Platform Flash memory. By default the Spartan-3 devices is programmed from the Platform Flash memory at power up. Direct JTAG programming of the Spartan-3 is volatile and the FPGA will lose its configuration every time that the board power is cycled. From sustained use of FPGA design programming the design into the Platform Flash memory is recommended. Generation of suitable Platform Flash content files and control of the JTAG chain can be achieved using the XILINX ISE tool IMPACT.

Voltage Regulators

Two Texas Instrument TPS70402 devices are fitted. These devices have one 1Amp regulator and one 2 Amp regulator in each package. Current capabilities are listed in the "Getting Started" section of this manual.

5V is taken directly from the PCI or other input and the current limitation is determined by the interface used for power input.

I/O Header

Figure 11 – I/O Header

The Spartan-3 connections following are left to right as the above picture. Pin A1 is top left pin.

	1	2	3	4	5	6	7	8	9	10
A	3V	C22	D21	E21	E22	F21	G21	G22	K21	K22
B	GND	D19	D20	E19	E20	E18	F20	F18	G17	G18

	11	12	13	14	15	16	17	18	19	20
A	L17	L21	M21	N22	N21	T22	T21	U21	M17	V22
B	G19	K20	L20	L19	L18	M19	N20	M20	M18	V21

	21	22	23	24	25	26	27	28	29	30
A	W21	W22	Y22	Y21	U18	AA18	Y18	Y17	V17	U17
B	R18	T18	U19	V19	V20	Y12	W20	AB18	AA17	W17

	31	32	33	34	35	36	37	38	39	40
A	U16	AA15	AB15	U14	V14	W13	V12	U12	3V	5V
B	W16	V16	T17	AB14	W14	AA13	Y13	U13	GND	GND

PCI Edge Connector

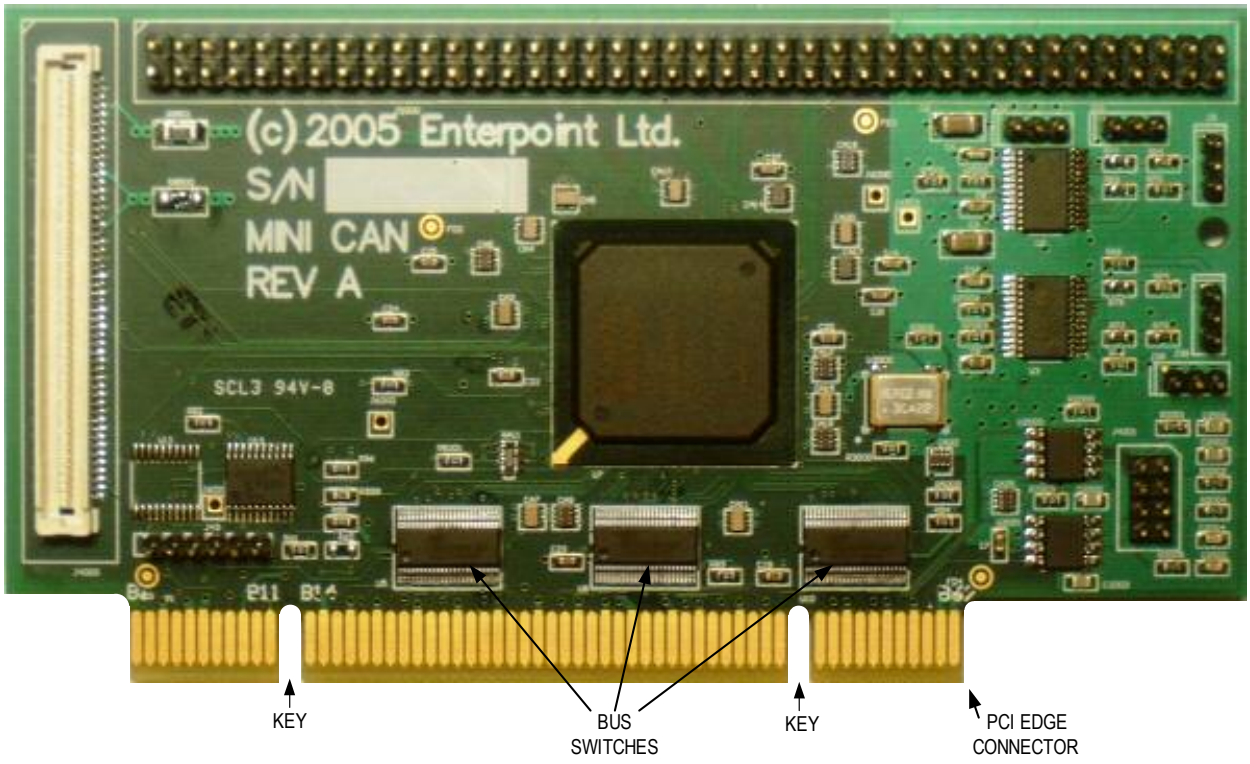

Figure 12 - MINI-CAN PCI Interface Features

WARNING – MINI-CAN HAS BEEN DOUBLE KEYED TO ALLOW USE IN BOTH 3.3V AND 5V PCI SOCKETS. IT IS POSSIBLE TO PLUG MINI-CAN INTO THE PCI SOCKET BACKWARDS OR DISPLACED. IF A MINI-CAN IS INSERTED INCORRECTLY AND POWERED THE MINI-CAN, AND HOST SYSTEM, WILL BE DAMAGED. WE HAVE SEEN POWER SUPPLY LEADS MELT AND CATCH FIRE UNDER THESE CIRCUMSTANCES. TAKE EXTRA CARE TO ENSURE MINI-CAN IS INSERTED CORRECTLY.

MINI-CAN has been design to work in both 3.3V and 5V PCI systems. For this interface to work as a PCI interface you will need to buy, or design, a suitable FPGA PCI logic circuit or IP core. MINI-CAN will be supplied with test builds containing a PCI IP core and other cores for your evaluation and use. We are hoping to release our own low cost Target Only PCI Core shortly.

MINI-CAN supports a 32 bit, 33 MHz, implementation of PCI.

The pinout of the Spartan-3 FPGA has been chosen such that the PCI interface follows the Xilinx PCI IP core (XC3S400-4FG456C pinout). FPGA pin numbers are available on the customer schematics.

The Spartan-3 FPGA has an absolute input voltage maximum of 4.05V (3.3V signalling). To allow use in 5V PCI systems we have added Bus Switch parts IDTQS32X681 between the PCI Edge Connector and the Spartan-3 FPGA. These parts limit the voltage seen by the Spartan-3 FPGA. Technically the addition of these parts make the interface non-compliant with the PCI specification. However in practise this implementation of the interface has no operation issues.

If you don't want to use the PCI Edge Connector for PCI and run MINI-CAN standalone you can use the Disk Drive Power Connector to power the board. Using the optional PCI I/O Expansion Module you can use PCI interface as general I/O.

Figure 13 - PCI I/O Expansion Module

If you need 5V tolerant I/O, and don't need PCI then, then using this module is a easy way of achieving this. The Bus Switches on MINI-CAN, fitted for 5V PCI tolerance, work as well for general 5V input, or pulled up, signals. The timing penalty, i.e. through propagation, of the Bus Switches is approximately 250 pico-seconds.

Fine Pitch Connector

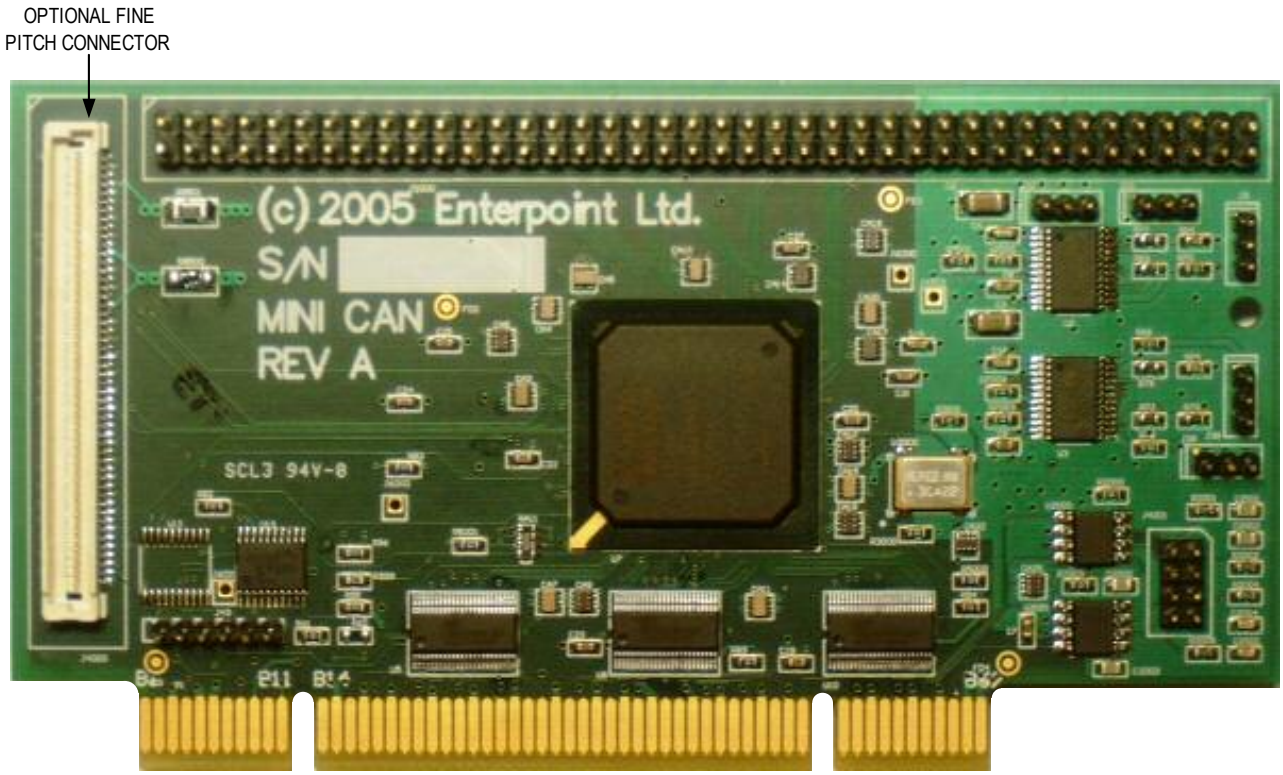

Figure 14 - Optional Fine Pitch Connector

The optimal Fine Pitch Connector provides a mechanical and electrical interface for add-on modules. Pinout of this connector is available in the schematics.

This connector offers a limited LVDS support. As yet LVDS functionality has not been tested. Please contact Enterpoint support if you wish to use LVDS.

The connector has 3V and 5V connections.

Medical and Safety Critical Use

MINI-CAN is not authorised for the use in, or use in the design of, medical or other safety critical systems without the express written person of the Board of Enterpoint. If such use is allowed the said use will be entirely the responsibility of the user. Enterpoint Ltd will accept no liability for any failure or defect of the MINI-CAN, or its design, when it is used in any medical or safety critical application.

Warranty

MINI-CAN comes with a 90 return to base warranty.

Outside warranty Enterpoint offers a fixed price repair or replacement service. We reserve the right not to offer this service where a MINI-CAN has been maltreated or otherwise deliberately damaged. Please contact support if need to use this service.

Other specialised warranty programs can be offered to users of multiple Enterpoint products. Please contact sales on boardsales@enterpoint.co.uk if you are interested in these types of warranty,

Support

Enterpoint offers support during normal United Kingdom working hours 9.00am to 5.00pm. Please examine our MINI-CAN FAQ web page and the contents of this manual before raising a support query. We can be contacted as follows:

Telephone - +44 (0) 1684 585262
Email - support@enterpoint.co.uk